GEOLOGY OF A PORTION OF THE MAXVILLE GROUP
EXPOSED IN THE SOMERSET QUARRY NEAR
SOMERSET, (PERRY CO.), OHIO.

SENIOR THESIS

Presented in Partial Fulfillment of the Requirements
for the Degree Bachelor of Sciences

by

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INTRODUCTION

During October and November, 1973, I measured and described the beds exposed in the Somerset Quarry in Perry County, Ohio. Bulk rock collections were disaggregated in the laboratory at The Ohio State University. Conodont elements and other insoluble residues were extracted for study. Peels and stained slabs were used for the textural identification of the limestones and a x-ray analysis was made on the mud.

Somerset Quarry is located in the Somerset Quadrangle, T17N,R16W of section 29, SW$\frac{1}{4}$SW$\frac{1}{4}$. Elevation at the top of the section is 1060 feet above mean sea level.

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REGIONAL GEOLOGIC SETTING

The name Maxville Limestone was first proposed by E. B. Andrews in 1871 for a discontinuous limestone which lies disconformably above the Logan Formation and disconformably below the Pennsylvanian in Ohio. Andrews, (1878), stated that the patchy distribution of the Maxville is a result of pre-Pennsylvanian erosion of a once continuous deposit. Although Andrews' findings were challenged at first, more recent investigations have shown his views to be correct, (Morse, 1910; Stout, 1916; and Flint 1951). The Maxville Limestone of Andrews has since been divided into three distinct lithologic units of formational status. Hence, the name Maxville Limestone is now known as the Maxville Group. The three formations in ascending order are Dillon Falls, Jonathan Creek, and Bluerock Creek.

SUMMARY OF DEPOSITIONAL AND EROSIONAL HISTORY

Significant events in the history of the Maxville Group are summarized by Scatterday (1963) and are given below and schematically in Figure 1.

1.--Marine transgression from the south over the post Logan surface in east-central Ohio during later Valmeyeran time. In east-central Ohio the sea was confined to lowlands, with islands of Logan strata projectiong above sea level. Carbonate deposits of the Dillon Falls formation

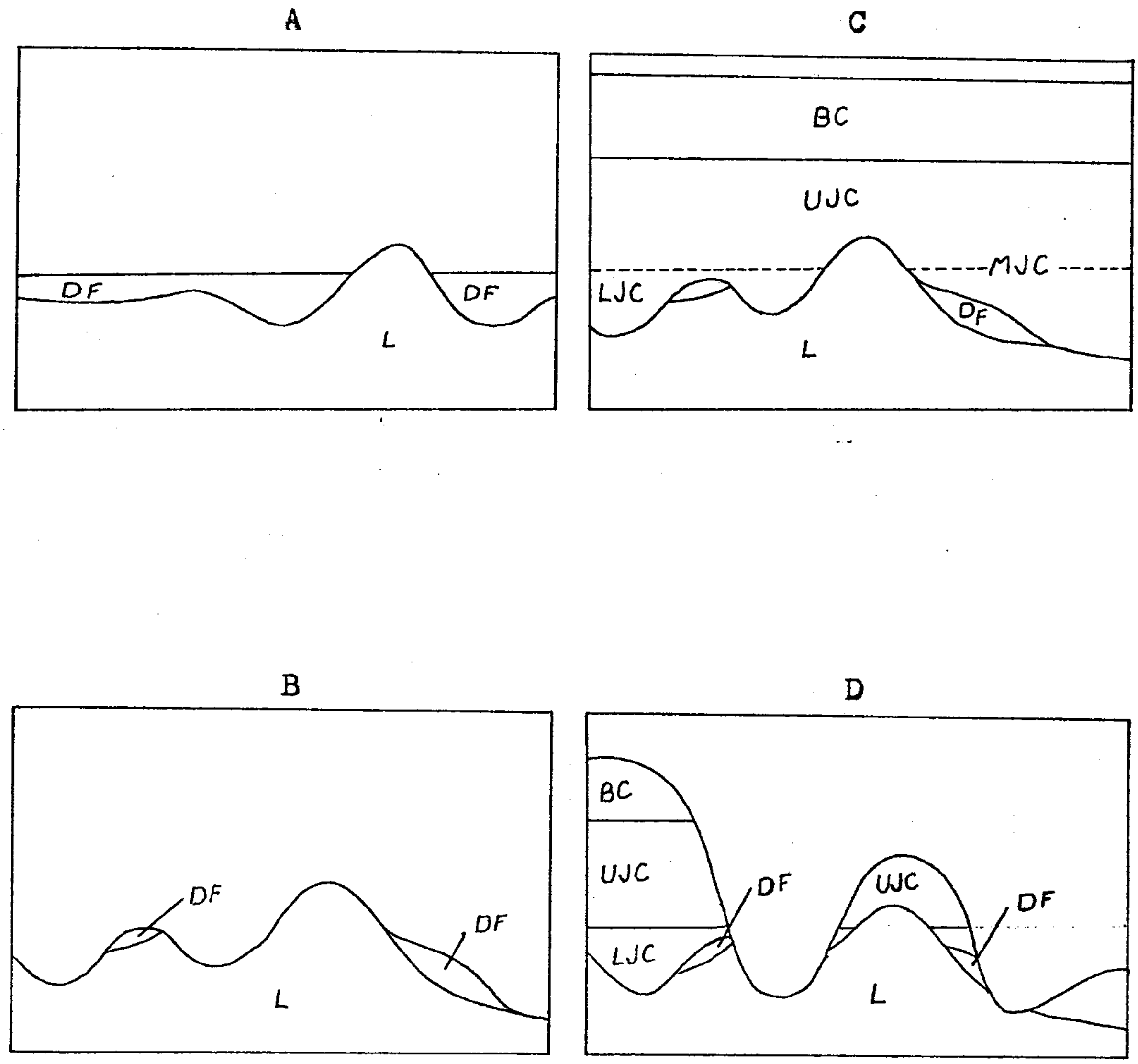


FIG. 1. (after Scatterday, 1963)

DF, Dillon Falls Fm.; LJC, MJC, UJC, Lower, Middle and Upper Members of the Jonathan Creek Fm.; BC, Bluerock Creek Fm.; L, Logan Fm.

were than separated by topographic highs (Figure 1A).

2.--Uplift and erosion of Dillon Falls strata (Figure 1B). Uplift was greatest in east-central Ohio; consequently this area exhibits the greatest dissection. Therefore, contemporaneous deposits lie, for the most part, in valleys cut below the St. Louis.

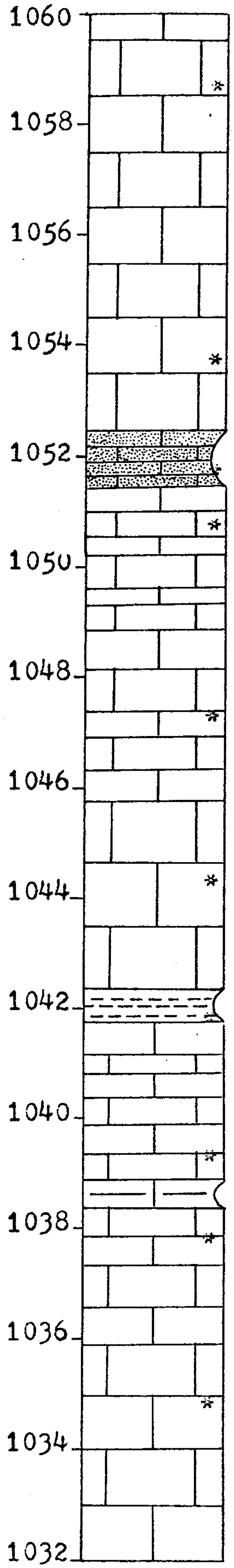
3--Deposition of Jonathan Creek and Bluerock Creek formations (Figure 1C). The lower member of the Jonathan Creek formation filled only valleys, the remainder of the Jonathan Creek, and the Bluerock Creek were more widespread, interrupted only by occasional hills which persisted during the post-Logan and post-Dillon Falls Periods of erosion.

4.--Post-Maxville uplift and erosion of the Maxville Group and upper portion of the Logan (Figure 1D).

QUANTITATIVE ANALYSIS OF SAMPLES

The section was sampled at changes in lithology or at intervals of three feet when contacts were indistinct (Figure 2.). Slabs and Acetate peels were made and the remainder of the samples were crushed. The crushed samples were weighed and placed into polyethylene baskets which in turn were placed into ten-quart buckets. Water and 750ml. of 99.5% acetic acid was added to a point where it covered the samples. The samples remained in this solution until all of the calcium carbonate had been digested. The remaining material was washed, sorted and dried. The

FIGURE 2.



Limestone - same as below, more fossiliferous, brachiopods, gastropods, pelecypods, compaction structures.

Limestone - light gray, slightly fossiliferous, braciopods, massive, voids filled with crystalline calcite.

Silty limestone - dark gray to black, silt is in lenses 1-2cm. thick, beds are 1-3 inches thick.

Dolomitic limestone - gray, thin-bedded with lenses of limy mudstone.

Limestone - light gray to gray, beds are 8-10 inches thick. Grades into above.

Dolomitic limestone - gray, massive with conchoidal fractures, wispy "hair-like" structures 1-10cm. long. Grades into above.

Limy mudstone - light gray, thin bedded, very friable.

Dolomitic limestone - light gray with laminations of gray, less distinict than below, beds 4 inches to 1 foot thick.

Dolomitic limestone - light gray with alternating laminations of dark gray, thin beds, upper 1 foot very argillaceous. Grades into above.

Limestone - light gray, massive, conchoidal fractures.

*Samples taken, Ex. 73RA7-5 was taken 7 feet 5 inches from base.

SCALE - 1" = 3'

Sample No.	a Total weight g.	b Coarse g. >.05"	c Sand g.** .01"-.05"	MUD* d Dolomite g.	MUD* e Quartz g.	MUD* f Illite g.	MUD* g Kaolinite g.	Calcite % by wt. $\frac{(a-(b+c+d+e+f+g))}{a}$	Dolomite % by wt. $\frac{(b+d)}{a}$	Quartz % by wt. $\frac{(c+e)}{a}$	Clays % by wt. $\frac{(f+g)}{a}$
73RA-3	580	0	-	-	34	3	3	93	-	6	1
73RA-6	1060	191	-	187	53	-	-	58	37	5	-
73RA7-5	1000	82	-	243	99	-	-	57	33	10	-
73RA10	1040	27	301	-	484	22	18	21	3	73	3
73RA12-8	1600	447	-	-	102	10	-	65	28	6	1
73RA15-2	1500	0	-	-	76	29	-	93	-	5	2
73RA-19	1560	186	-	275	78	18	-	65	29	5	1
73RA-20	420	72	44	-	47	-	-	61	17	22	-
73RA-22	1360	69	-	-	292	-	-	73	7	20	-
73RA-27	690	0	-	-	142	-	-	81	-	19	-

(Figure 3)

* Determined by X-ray diffraction
** Weights LT. 1% of total are disregarded

Individual components were than examined and weighed to determine their composition (Figure 3).

MICROSCOPIC STUDY OF SLABS AND PEELS

Peels were prepared by first polishing the slab surfaces. The surfaces were than etched with dilute hydrochloric acid and allowed to dry. Acetone was applied liberally to the slab surfaces and acetate paper (.03in.) was carefully placed over the acetone. The acetate paper was peeled off the slab surfaces after one hour. The slabs were once again polished and stained with Alizarin Red to detect the presence of dolomite.

73RA-3 -- Sparse biomicrite with fragments of brachiopods, gastropods and foraminifera. Subangular quartz grains (<10%, .02-.04), are present along with voids filled with sparry calcite.

73RA-6 -- Alternating laminations of silty black micrite and gray fossiliferous micrite. Quartz is present in larger sizes and larger quantities in the black micrite (10%-20%, .02-0.10mm.), as opposed to (<10%, .02-.04mm.) in the gray micrite. Shell fragments and foraminifera are present in both micrites along with sparry dolomite and pyrite (1%).

73RA7-5 -- Micrite with small quantities of quartz and pyrite.

73RA-10 -- Gray limy, mudstone; extremely friable, no slabs or peels made.

73RA12-8 -- Sparse biomicrite with shell and foraminifera fragments. Voids are filled with both sparry and cryptocrystalline calcite. Quartz is present in quantities of (<10%), ranging in size from (.01-.04mm.). Pyrite (10%), was also noted filling cavities. Long, "wispy-like" secondary structures on the order of 1-10cm. are also present.

73RA15-2 -- Dismicrite with quartz (<10%, .02-.06mm.) and bands of yellowish-brown stains on the order of 1-2mm. in width.

73RA-19 -- Micrite with crystals of calcite and dolomite in sizes (0.2-0.4mm.) are distributed uniformally throughout the specimen. Quartz is present, (<10%) ranging in size from (.01-.04mm.).

73RA-20 -- Alternating bands of fine sand and silty micrite. The sand grains are moderately sorted, ranging in size from (0.1-0.4mm), and moderately rounded to rounded, with a matrix of silty micrite and pelets. The silty micrite is gray to black with (10%-20%) quartz in sizes from (.02-.04mm.). The contact between the two is sharp, withlenticular bands of fine sand grains present in the micrite. Brachiopods and shell fragments are also present in the sample.

73RA-22 -- Sparse biomicrite with braciopods and shell fragments. Voids are filled with cryptocrystalline and sparry calcite.

73RA-27 -- Sparse biomicrite with bands of packed biomicrite. Brachiopod cavities are filled with mud and sparry calcite. The organic material is mostly brachiopods and brachiopod fragments. Quartz is present, (<10%) ranging in size from (.01-.02mm).

X-RAY ANALYSIS OF MUD

X-ray work was conducted on the General Electric X-ray Difractometer using CuK alpha radiation. Mud samples left from washing insoluble residues were dried and mounted on glass slides with acetone and Duco cement. The samples were then placed in the difractometer and the angle 2θ was measured from 5 through 35 degrees. The data was interpreted and the mineral components were determined. The relative abundance of the minerals were acquired from the equation (a), and the results are shown in Table 1.

Equation (a)

$$\%X = \frac{HX}{HX + HY + HZ}$$

Where, H = Height of peak in inches above normal

TABLE 1.

Sample #	Quartz %	Dolomite %	Illite %	Kaolinite %
73RA-3	84	-	8	8
73RA-6	22	78	-	-
73RA7-5	29	71	-	-
73RA-10	92	-	5	3
73RA12-8	91	-	9	-
73RA15-2	72	-	28	-
73RA-19	21	74	5	-
73RA-20	100	-	-	-
73RA-22	100	-	-	-
73RA-27	100	-	-	-

MAXVILLE CONODONTS

The sand size particles sorted from the bulk of the disaggregated material were passed through the Franz Isodynamic Separater to isolate the non-magnetic particles. These particles were then separated into "heavy" and "light" constituents with the aid of tetrabromoethane. The "heavy" components were searched for conodont elements. The conodonts were identified by comparing them with plates in Scatterday's thesis (1963). The three samples yielding conodonts are listed below.

73RA-3 -- Hindeodella undata Branson and Mehl. The specimen is incomplete with a cusp length of (1.15mm.).

73RA-3 -- Neoprioniodus peracutus (Hinde)? The specimen is incomplete with a cusp length of (2.10mm.).

73RA12-8 -- Cavusgnathus characta Rexroad. The specimen is complete, with a length of (0.55mm.), a width of (0.07mm.), and a height of (0.09mm.).

73RA12-8 -- Cavusgnathus unicornis Youngquist and Miller. The specimen is complete with a length of (0.60mm.), a width of (0.15mm.), and a height of (0.26mm.).

73RA12-8 -- Cavusgnathus convexa Rexroad. The specimen is incomplete.

73RA-22 -- Cavusgnathus characta Rexroad. The specimen is incomplete.

73RA-22 -- Cavusgnathus unicornis Youngquist and Miller.

The specimen is complete with a length of (0.62mm.), a width of (0.13mm.), and a height of (0.25mm.).

73RA-22 -- Cladognathodus ligonodinoides Rexroad. The specimen is incomplete.

73RA-22 -- Spathognathodus cristula Branson and Mehl The specimen is complete with a length of (0.50mm.), a width of (0.05mm.), and a height of (0.21mm.).

CORRELATION OF SOMERSET QUARRY CONODONTS

Maxville conodont elements according to their respective formation and member are shown schematically in Table 2. The species Hindeodella undata was found in sample 73RA-3 (the base of the section). H. undata is no older than the lowest member of the Jonathan Creek Formation. Therefore, I am reasonably sure that the base of the quarry is no older than the lower member of the Jonathan Creek Formation. In addition, Cladognathodus ligonodinoides was found only in 73RA-22 (near the top of the section). C. ligonodinoides occurs only between the lower member and 20 feet above the base of the upper member of the Jonathan Creek Formation. Therefore, it seems logical to assume that the top of the section is no younger than the upper most range of this species.

TABLE 2. DISTRIBUTION OF MAXVILLE CONODONT SPECIES AT SOMERSET QUARRY

DIVISIONS OF THE MAXVILLE GROUP — Stratigraphic & Bio-stratigraphic / CONODONT GENERA & SPECIES	DILLON FALLS FM.		JONATHAN CREEK FM.					BLUEROCK CREEK FM.
	Lower Mbr.	Upper Mbr.	Lower Mbr.	Middle Mbr.	Upper Mbr.			
					0 to 10 feet above base	10 to 20 feet above base	20 feet above base to top	
CAVUSGNATHUS Harris & Hollingsworth								
C. characta Rexroad		?	X	?	?	?		
C. convexa Rexroad		?	X	X	X	X		X
C. unicornis Youngquist & Miller	X	X	X	X	X	X	X	X
CLADOGNATHODUS Rexroad								
C. ligonodinoides Scatterday, n. sp.			X	X	X	X		
HINDEODELLA Bassler								
H. undata Branson & Mehl			X	X	X	X	X	
NEOPRIONIODUS Rhodes & Miller								
N. peracutus (Hinde)?			X	X	X	X		
SPATHOGNATHODUS Branson & Mehl								
S. cristula Youngquist & Miller			X	X	X	X	X	X

SUMMARY

In accordance with the conodont species found, the age of the exposure at Somerset Quarry has been placed between the lower member and 20 feet above the base of the upper member of the Jonathan Creek Formation of the Maxville Group. More exact ages are beyond the scope of this thesis.

The strata at the exposure was found to contain limestones, dolomitic limestones, mudstones, and lenses of silt and fine sand. It is probable that these sediments were deposited in a quiet, shallow, marine environment.

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